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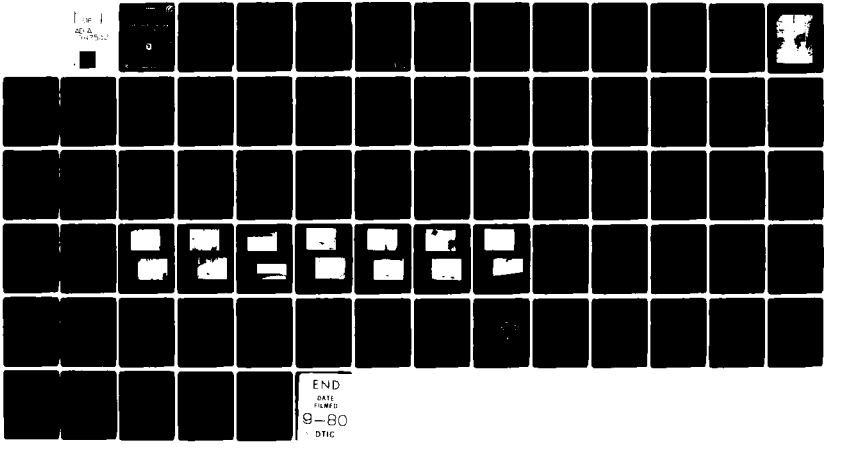

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DELAWARE RIVER BASIN
BRANCH OF THE PEQUEST RIVER
SUSSEX COUNTY
NEW JERSEY

LAKE VALENTINE DAM
NJ 00297

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

JANUARY 1980

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Lake Valentine Dam (NJ00297) Delaware River Basin, Branch of the Pequest River, Sussex County, New Jersey.
Phase I Inspection Report.

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6 Concord Rd.
Concord, N.H. 03301

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Division of Water Resources
P.O. Box CN029
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Lake Valentine Dam, New Jersey
Seepage

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

29 JUL 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Lake Valentine Dam, Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Lake Valentine Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to seven percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Within thirty days from the date of approval of this report, the owner should engage a professional engineer qualified in the design and construction of dams to design and supervise repairs for the hole in the spillway approach channel.

b. The spillway's adequacy should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

c. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepage and the wet, soft areas at the downstream toe of the dam and design and oversee the construction of appropriate remedial measures.

(2) Design procedures for and oversee the removal of trees from the embankment and from the base of the training wall on the southwest bank of the spillway discharge channel.

(3) Design procedures for and oversee the removal and proper placement of irregularly placed fill on the downstream slope of the dam between the center of the valley and the spillway at the northeast abutment.

(4) Design and oversee the construction of erosion protection on the upstream slope of the dam and on the southwest bank of the spillway discharge channel downstream of the left training wall.

(5) Design and oversee repairs to the mortared stone masonry training walls.

(6) Design and install adequate means to drain the reservoir in case of emergency.

d. The following remedial actions should be initiated within thirty days from the date of approval of this report:

(1) Plug the hole in the spillway approach channel temporarily with suitable material until permanently repaired.

(2) Clear debris from the spillway discharge channel and maintain the channel free of debris.

(3) Clear grass clippings, leaves, and brush from the downstream slope of the dam and maintain the slope free of all debris.

(4) Monitor the seepage at the downstream toe of the dam until remedial measures are completed.

e. The following remedial actions should be initiated within six months from the date of approval of this report:

(1) Clear trees and brush for a distance of 25 feet downstream of the dam, and from a zone 25 feet wide on either side of the discharge channel for a distance of at least 50 feet downstream from the dam or to the nearest property line, whichever is closer to the dam.

(2) Establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure.

f. Within one year from the date of approval of this report the owner should develop written operating procedures and a periodic maintenance plan to ensure safety of the dam.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

LAKE VALENTINE DAM (NJ00297)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 9 November 1979 by Anderson-Nichols & Co., Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Lake Valentine Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to seven percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Within thirty days from the date of approval of this report, the owner should engage a professional engineer qualified in the design and construction of dams to design and supervise repairs for the hole in the spillway approach channel.

b. The spillway's adequacy should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

c. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepage and the wet, soft areas at the downstream toe of the dam and design and oversee the construction of appropriate remedial measures.

(2) Design procedures for and oversee the removal of trees from the embankment and from the base of the training wall on the southwest bank of the spillway discharge channel.

(3) Design procedures for and oversee the removal and proper placement of irregularly placed fill on the downstream slope of the dam between the center of the valley and the spillway at the northeast abutment.

(4) Design and oversee the construction of erosion protection on the upstream slope of the dam and on the southwest bank of the spillway discharge channel downstream of the left training wall.

(5) Design and oversee repairs to the mortared stone masonry training walls.

VI

(6) Design and install adequate means to drain the reservoir in case of emergency.

d. The following remedial actions should be initiated within thirty days from the date of approval of this report:

(1) Plug the hole in the spillway approach channel temporarily with suitable material until permanently repaired.

(2) Clear debris from the spillway discharge channel and maintain the channel free of debris.

(3) Clear grass clippings, leaves, and brush from the downstream slope of the dam and maintain the slope free of all debris.

(4) Monitor the seepage at the downstream toe of the dam until remedial measures are completed.

e. The following remedial actions should be initiated within six months from the date of approval of this report:

(1) Clear trees and brush for a distance of 25 feet downstream of the dam, and from a zone 25 feet wide on either side of the discharge channel for a distance of at least 50 feet downstream from the dam or to the nearest property line, whichever is closer to the dam.

(2) Establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure.

f. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 20 Jun 80

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Lake Valentine Dam
ID Number:	Fed. ID No. NJ00297
State Located:	New Jersey
County Located:	Sussex
Stream:	Branch of Pequest River
River Basin:	Delaware
Date of Inspection:	November 9, 1979

ASSESSMENT OF GENERAL CONDITIONS

Lake Valentine Dam is an old dam of undetermined age, known to be rebuilt in 1935, and is in poor overall condition. It is small in size and is recommended to be downgraded to significant hazard. Seepage estimated at 15 gpm was discharging at two locations on the downstream toe of the dam. Much of the area immediately downstream of the toe of the dam in the deepest section of the valley was wet and soft. A hole about 4 inches in diameter was observed in the earth bottom of the spillway approach channel. A small whirlpool was noted above the hole with about a 6 to 8 inch depth of water over the hole. The water flowing into the hole was observed to be discharging at the base of a broken section of the stone masonry training wall on the northeast bank of the spillway discharge channel. The spillway discharge channel was partially clogged with brush and debris. Two trees are growing at the base of the south east bank of the discharge channel. Some of the mortared stone masonry abutment is eroded and the mortar is broken in several places. Trees are growing on the upstream and downstream slopes and crest of the dam. The spillway is capable of passing 6 percent of the selected SDF or 3 percent of the PMF without causing the dam to overtop and is considered inadequate.

We recommend that the owner engage a professional engineer, qualified in the design and construction of dams, to accomplish the following in the time frames specified. Immediately design and supervise repairs for the hole in the spillway approach channel. In the near future: investigate the seepage and the wet, soft areas at the downstream toe of the dam, and design and oversee the implementation of appropriate remedial measures; specify and supervise procedures for the removal of the trees and their roots from the embankment and from the base of the southwest training wall of the spillway discharge channel; design and oversee procedures for the removal and the proper replacement of irregularly placed fill on the downstream slope of the dam; design and supervise the construction of erosion protection on the upstream slope ofthe dam and the southeast bank of the spillway discharge channel downstream of the training wall;

design and oversee repairs to the mortared stone masonry training walls; conduct further hydrologic and hydraulic analysis of the watershed, reservoir and spillway to determine the need for and type of mitigating measures to prevent overtopping; and design and install adequate means to drain the reservoir in case of emergency.

We further recommend that as a part of operating and maintenance procedures the owner should undertake the following immediately; plug the hole temporarily with a suitable material until it can be permanently repaired; clear debris from the spillway discharge channel, and maintain the channel free of debris; clear grass clippings, leaves, and brush from the downstream slope of the dam and maintain the slope free of all debris; monitor the seepage at the downstream toe of the dam until remedial measures are effected.

In the near future the owner should undertake the following: clear trees and brush for a distance of 25 feet downstream of the dam, and from a zone 25 feet wide on either side of the discharge channel for a distance of a least 50 feet downstream from the dam or to the nearest property line, whichever is closer to the dam; establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

ANDERSON-NICHOLS & COMPANY, INC.

Warren A. Guinan

Warren A. Guinan, P.E.
Project Manager
New Jersey No. 16848

OVERVIEW
LAKE VALENTINE DAM

NOV 09 1979

CONTENTS
PHASE I INSPECTION REPORT
LAKE VALENTINE DAM N.J. NO. 22-116 FED ID NO. NJ00297

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
LAKE VALENTINE DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Lake Valentine Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by a letter dated 26 October 1979, under Contract FPM No. 39 dated 28 June 1978. This authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Co., Inc. on 7 November 1979.

b. Purpose. The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of Lake Valentine Dam and appurtenances based upon available data and visual inspection, and, determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Lake Valentine Dam is an old (See Section 1.2 g.) earthfill dam approximately 235 feet long with an average topwidth of 33 feet. The structural height is 12 feet and the hydraulic height is 10.8 feet. The downstream face of the dam has a slope of 2H:1V, as does the visible part of the upstream face. A concrete spillway structure (17.5 feet long) is located at the southwest end of the dam. The spillway is divided into three sections by 1 foot wide by 1.7 feet high concrete piers. There is a wooden stoplog in the middle section. The stoplog is 2 inches thick, 4 feet long and 1.0 foot high. The elevation of the top of the stoplog and the concrete crest in the other two spillway sections is 778.9 feet NGVD. A wooden deck spans the spillway. Both ends of the spillway join mortared stone masonry abutments which extend as training walls for about 30 feet downstream. The channel downstream of the dam is steep, rocky, and overgrown with trees. The channel is well defined from the dam to a point about 600 feet downstream. The dam abutment beyond the southwest spillway abutment slopes moderately 15H:1V upwards for approximately 80 feet. The northeast abutment slopes upwards at 4H:1V for about 150 feet. The watershed above the reservoir is gently to steeply sloping and wooded. There is a natural saddle at the north end of the lake which has a minimum elevation of 782.1 feet NGVD (cross-section included in Appendix 3). A second natural saddle, with a minimum elevation of 782.5, is located at the south end of the lake and is adjacent to Route 613 (cross-section included in Appendix 3). Essential features of the dam are shown in Figure 1.

b. Location. The dam is located in the town of Andover, Sussex County, New Jersey, on a branch of the Pequest River. Its coordinates are north latitude 41° 00.4' and west longitude 74° 42.5'. A location map is shown in Figure 2.

c. Size Classification. Lake Valentine Dam is classified as being small in size, as defined in the Recommended Guidelines for Safety Inspection of Dams, on the basis of its hydraulic height of 10.8 feet, which is less than 40 feet, and its storage volume of 71 acre-feet which is less than 1000 acre-feet, but more than 50 acre-feet.

d. Hazard Classification. Visual inspection of the area downstream of the dam indicated that a failure of Lake Valentine Dam could cause significant property damage to one house inhabited by four persons. The house is located approximately 900 feet downstream of the dam and its first floor elevation is about 11 feet above the streambed. However, the garage elevation is only 3 feet above the streambed. Because the channel between the house and dam is steep and narrow loss of life is possible. A failure of the dam could also cause damage to a culvert and a road located approximately 1100 feet downstream of the dam. Lake Valentine Dam is thus classified as Significant Hazard.

e. Ownership. Lake Valentine Dam is presently owned by Mr. and Mrs. Frank Kerstner, Kilroy Road, Andover, New Jersey 07821. Telephone (201) 786-5032.

f. Purpose of Dam. The dam was originally constructed to impound a pond for recreational use. Currently the lake serves this same purpose.

g. Design and Construction History. The date of original construction is unknown. Reference data from NJDEP file, dated 8/8/35 indicates that the original dam failed in October, 1934. A local resident indicated that the failure was caused by muskrats building in the embankment. The dam was rebuilt in 1935. The available data also contains a report on the application for a permit to rebuild the dam which includes the principal features of the dam and the general plan of the dam. The report and sketches are not suitable for reproduction and thus cannot be included in this report.

h. Normal Operating Procedures. No formal operating procedures were revealed.

i. Site Geology. No site specific geologic information (such as borings) was available at the time the dam was inspected. Information derived from a Geologic Map of New Jersey (Lewis and Kummel, 1912) indicates that soils within the immediate site area consists of ground moraine overlying bedrock.

Although no outcrops were observed during inspection of this dam, the previously mentioned map indicated that the underlying bedrock consists of granitoid gneiss of Precambrian age.

1.3 Pertinent Data

a. Drainage area - 0.55 square mile

b. Discharge at damsite (cfs)

Maximum flood at damsite - unknown

Spillway capacity at normal pool elevation with stoplog in place (as during inspection) - 1.8±

Spillway capacity at top of dam with stoplog in place - 83

c. Elevation (ft. above NGVD)

Top of dam - 780.2

Low point in saddle at north end of the lake - 782.1

Low point in saddle at south end of the lake - 782.5

Maximum pool - design surcharge (½ PMF) - 782.1

Recreation pool - (at the time of inspection) - 779.

Spillway crest - 778.9

Streambed at centerline of dam - 769.4

Maximum tailwater - (estimated) - 773.3

d. Reservoir Length (feet)

Maximum pool - 1600

Recreation pool - 800

e. Storage (acre-feet)

Recreation pool - 55

Design surcharge - (½ PMF) - 98

Top of dam - 71

f. Reservoir Surface Area (acres)

Top of dam - 13.5

Recreation pool - 11.0

Spillway crest - 11.0

g. Dam

Type - earthfill

Length - 235 ± feet

Height - hydraulic - 10.8 feet

- structural - 12 feet

Topwidth - 33± feet

Side slopes - upstream 2H:1V (visible part)

- downstream 2H:1V

Zoning - unknown

Impervious core - unknown

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - concrete step with downstream sloping apron

Length of weir - 17.5 feet

Crest elevation - with stoplog in place (as during inspection) - 778.9 feet NGVD

Gates - 2 x 12 - inch by 4-foot long stoplog

U/S Channel - Lake Valentine

D/S Channel - Branch of Pequest River

SECTION 2
ENGINEERING DATA

2.1 Design

No engineering design data or plans for the original dam were disclosed. According to reference data from NJDEP files, dated 4/8/35, the original dam failed in October 1934 and was rebuilt in 1935. The NJDEP file also contains a report on the application for a permit to rebuild the dam. The report includes principal features of the dam and general plan of the dam. The design was approved by John Brooks, Assistant Division Engineer for the State Water Supply Commission.

2.2 Construction

No original construction data were found.

2.3 Operation

No engineering operational data were revealed.

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files, and contact with the current owner and community officials revealed a very limited amount of information.

b. Adequacy. The information available was such that the evaluation of this dam was based solely on visual observations.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. Seepage is discharging at two locations on the downstream toe of the dam. Much of the area immediately downstream of the toe of the dam in the deepest section of the valley is wet and soft. Grass clippings, leaves, and cut brush have been dumped on the downstream slope of the embankment at several locations, including the two locations where seepage is discharging. Fill has been dumped irregularly on the downstream slope of the dam between the center of the valley and the spillway at the southwest abutment; logs, standing trees and boulders have been partially buried under this fill. Trees are growing on the upstream and downstream slopes and crest of the dam. Minor erosion of the upstream slope at the waterline has occurred.

b. Appurtenant Structures. A hole about 4 inches in diameter in the earthen bottom of the spillway approach channel was observed with a small whirlpool (vortex) above the hole. The water flowing into the hole discharges at the base of a broken section of the stone-masonry training wall on the right bank of the spillway discharge channel. Two trees are growing at the base of the stone-masonry training wall on the left bank of the spillway discharge channel. The spillway discharge channel is partially clogged with brush and debris. Some of the mortared stone masonry abutment is eroded and the mortar is broken in several places.

c. Reservoir Area. The watershed above the lake is gently to steeply sloping and wooded. Slopes adjacent to the lake appear to be stable. One home is located on the shore of the lake. No evidence of significant sedimentation was observed.

d. Downstream Channel. Major erosion of the left bank of the spillway discharge channel is taking place about 25 feet downstream from the left training wall. Trees overhang the downstream channel.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were discovered.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were revealed.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were obtained.

4.4 Warning System

No description of any warning system was found.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures the remedial measures described in Section 7.2 should be implemented as prescribed.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. No hydrologic or hydraulic design data were disclosed.

b. Experience Data. According to reference data, dams in New Jersey No. 22-116 from NJDEP files, dated April 8, 1935, the original dam failed in October 1934. (No high water elevation was recorded.) No other experience data were disclosed. A local resident indicated that the failure was caused by muskrats burrowing into the embankment.

c. Visual Observation. No visible evidence of damage to the structure caused by overtopping was observed. Seepage was discharging at an estimated 15 gpm at two locations on the downstream toe of the dam. Much of the area immediately downstream of the toe of the dam in the deepest section of the valley was wet and soft. A hole about 4 inches in diameter was observed in the earth bottom of the spillway approach channel. A small whirlpool or vortex was noted above the hole with about a 6-8 inch depth over the hole. The water flowing into the hole was observed to be discharging at the base of a broken section of the stone-masonry training wall on the right bank of the spillway discharge channel by noting outflow of stirred up sediment near the hole. At the time of the inspection about 1 inch of water was flowing over the stoplogs.

d. Overtopping Potential. The hydraulic/hydrologic evaluation for Lake Valentine Dam is based on a Spillway Design Flood (SDF) equal to one-half the Probable Maximum Flood (PMF) in accordance with the range of test floods given in the evaluation guidelines for dams classified as significant hazard and small in size. The PMF has been determined by application of the SCS Dimensionless Unit Hydrograph procedure to a 24-hour probable maximum storm of 22.3 inches. Hydrologic computations are given in Appendix 3. The routed half-PMF peak discharge for the subject watershed is 1428 cfs.

The minimum elevation of the dam allows 1.3 feet of depth above the stoplog before overtopping begins. Under this head, the spillway capacity is 83 cfs, which is less than the required SDF. Under half-PMF condition neither of the natural saddles on the south and north ends of the lake will be overtopped. Flood routing calculations indicate that Lake Valentine Dam will be overtopped for less than 7 hours to a maximum depth of 1.9 feet under half-PMF conditions. It is estimated that the dam can pass only 3 percent of the PMF without overtopping; thus the spillway is considered inadequate.

Because the dam is classified as Significant Hazard, the increase in downstream hazard due to overtopping failure was not assessed.

SECTION 6
STRUCTURAL STABILITY

6.1 Visual Observations

The presence of a hole in the spillway approach channel indicates that piping of soil has already occurred and the active flow of water into this hole could lead to further piping and a breaching of the dam at any time. Two seepages at the downstream toe of the dam could also result in piping and erosion of the dam. Loose fill, logs, brush, grass clippings, and leaves which have been dumped on the downstream slope of the dam and next to the downstream toe of the dam make it impossible to inspect those areas adequately and may conceal further or future piping which would endanger the dam. If trees growing on the embankment and at the base of the stone-masonry training wall on the southwest side of the spillway discharge channel blow over and pull out their roots, or if trees die and their roots rot, serious seepage and erosion problems could result.

Based on the visual inspection alone it is not possible to determine the character of the dam foundation or the embankment materials. Therefore, it is not possible to evaluate the factor of safety of the embankment against slope failure.

Erosion of the upstream slope of the dam and the left bank of the spillway discharge channel will affect the stability of the dam if it is not controlled.

6.2 Design and Construction Data

No design or construction data pertinent to the structural stability of the dam were disclosed.

6.3 Operating Records

A local resident, Mr. Killroy, stated that the dam was breached about 30-40 years ago. He stated that muskrats building in the embankment at that time caused the failure.

6.4 Post-Construction Changes

The dam was rebuilt in 1935 after it was breached.

6.5 Seismic Stability

This dam is in Seismic Zone 1. According to the Recommended Guidelines, dams located in Seismic Zone 1 "may be assumed to present no hazard from earthquake provided static stability conditions are satisfactory and conventional safety margins exist." None of the visual observations made during the inspection are indicative of unstable slopes. However, because no data are available concerning the engineering properties of the embankment and foundation materials for this dam, it is not possible to make an engineering evaluation of the stability of the slopes or the factor of safety under static conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Lake Valentine Dam, as rebuilt in 1935, is 44 years old and is in very poor condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based on the results of the visual inspection.

c. Urgency. The recommendations made in Section 7.2 a. and operating and maintenance procedures recommended in 7.2 c. should be implemented by the owner as prescribed below.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are described in 7.2 a. below. These problems require the attention of a professional engineer qualified in the design and construction of dams who will have to make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to instability of the dam.

7.2 Recommendations/Remedial Measures

a. Recommendations. The owner should engage a professional engineer qualified in the design and construction of dams to accomplish the following immediately:

(1) Design and supervise repairs for the hole in the spillway approach channel.

The owner should engage a professional engineer qualified in the design and construction of dams to accomplish the following in the near future:

(1) Investigate the seepage and the wet, soft areas at the downstream toe of the dam and design and oversee the construction of appropriate remedial measures.

(2) Design procedures for and oversee the removal of trees and their roots from the embankment and from the base of the training wall on the southwest bank of the spillway discharge channel.

(3) Design procedures for and oversee the removal and proper placement of irregularly placed fill on the downstream slope of the dam between the center of the valley and the spillway at the northeast abutment.

(4) Design and oversee the construction of erosion protection on the upstream slope of the dam and on the southwest bank of the spillway discharge channel downstream of the left training wall.

(5) Design and oversee repairs to the mortared stone masonry training walls.

(6) Conduct further hydrologic and hydraulic analysis of the watershed reservoir and spillway, to determine the need for and type of mitigating measures to prevent overtopping.

(7) Design and install adequate means to drain the reservoir in case of emergency.

b. Operating and Maintenance Procedures. The owner should immediately undertake the following:

(1) Plug the hole temporarily with suitable material until permanently repaired.

(2) Clear debris from the spillway discharge channel and maintain the channel free of debris.

(3) Clear grass clippings, leaves, and brush from the downstream slope of the dam and maintain the slope free of all debris.

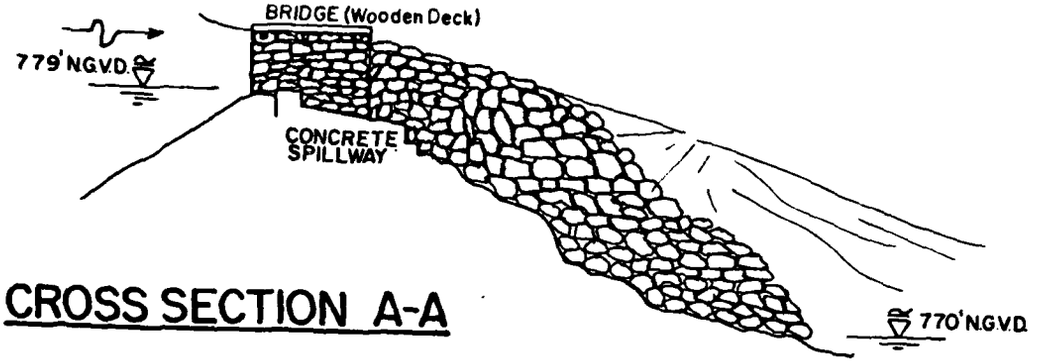
(4) Monitor the seepage at the downstream toe of the dam until remedial measures are effected.

The owner should undertake the following in the near future:

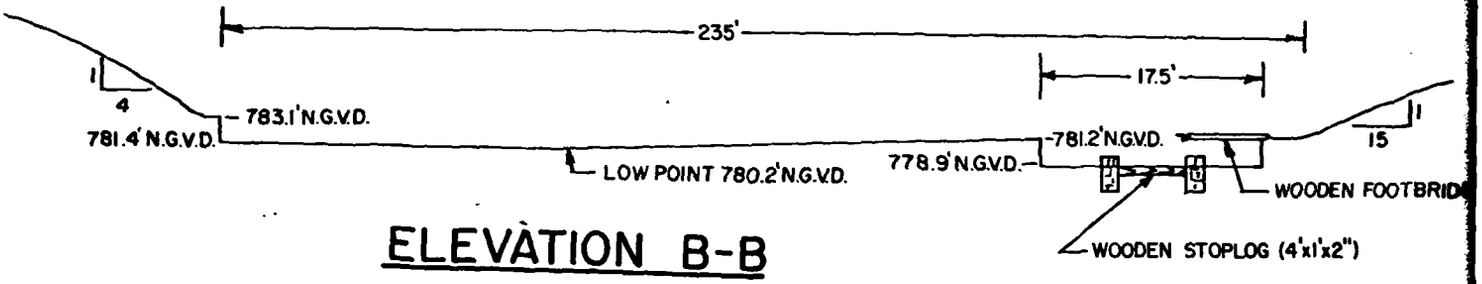
(1) Clear trees and brush for a distance of 25 feet downstream of the dam, and from a zone 25 feet wide on either side of the discharge channel for a distance of at least 50 feet downstream from the dam or to the nearest property line, whichever is closer to the dam.

(2) Establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure.

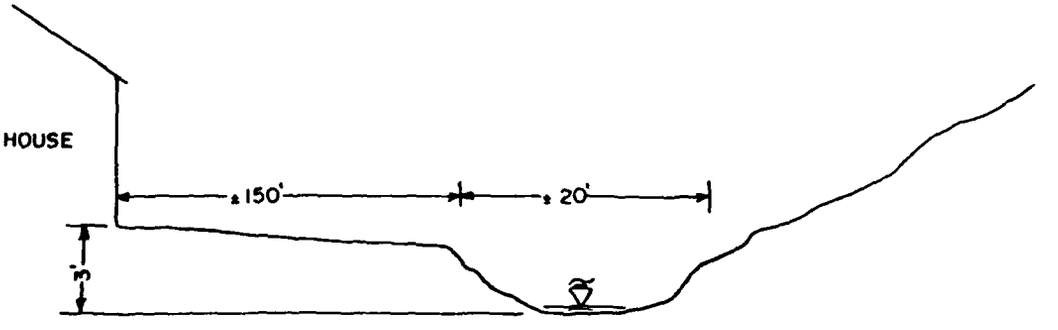
Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.



CROSS SECTION A-A

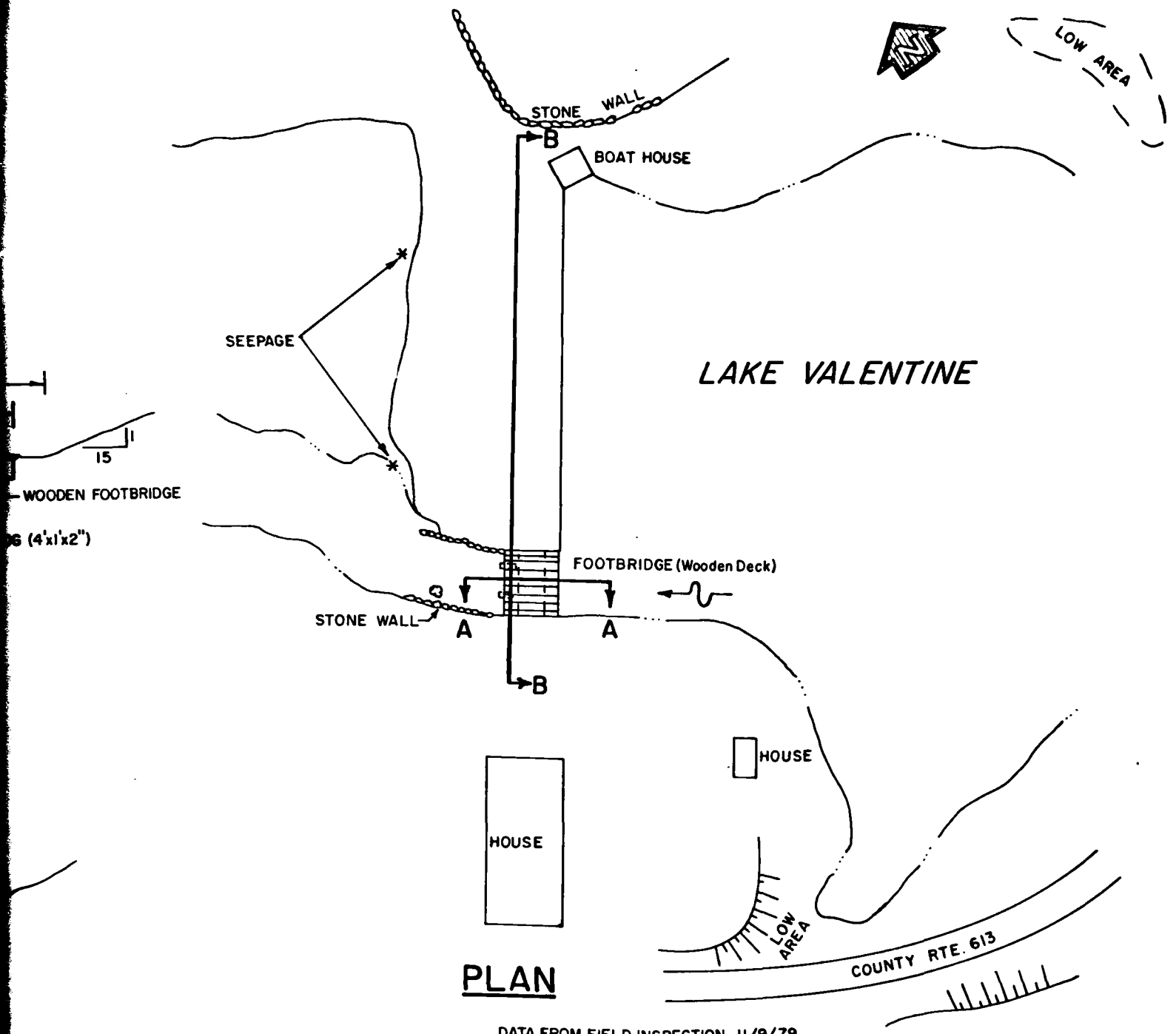


ELEVATION B-B



CHANNEL SECTION

APPROX. 900' DOWNSTREAM OF DAM



PLAN

DATA FROM FIELD INSPECTION 11/9/79

Anderson-Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIST. PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

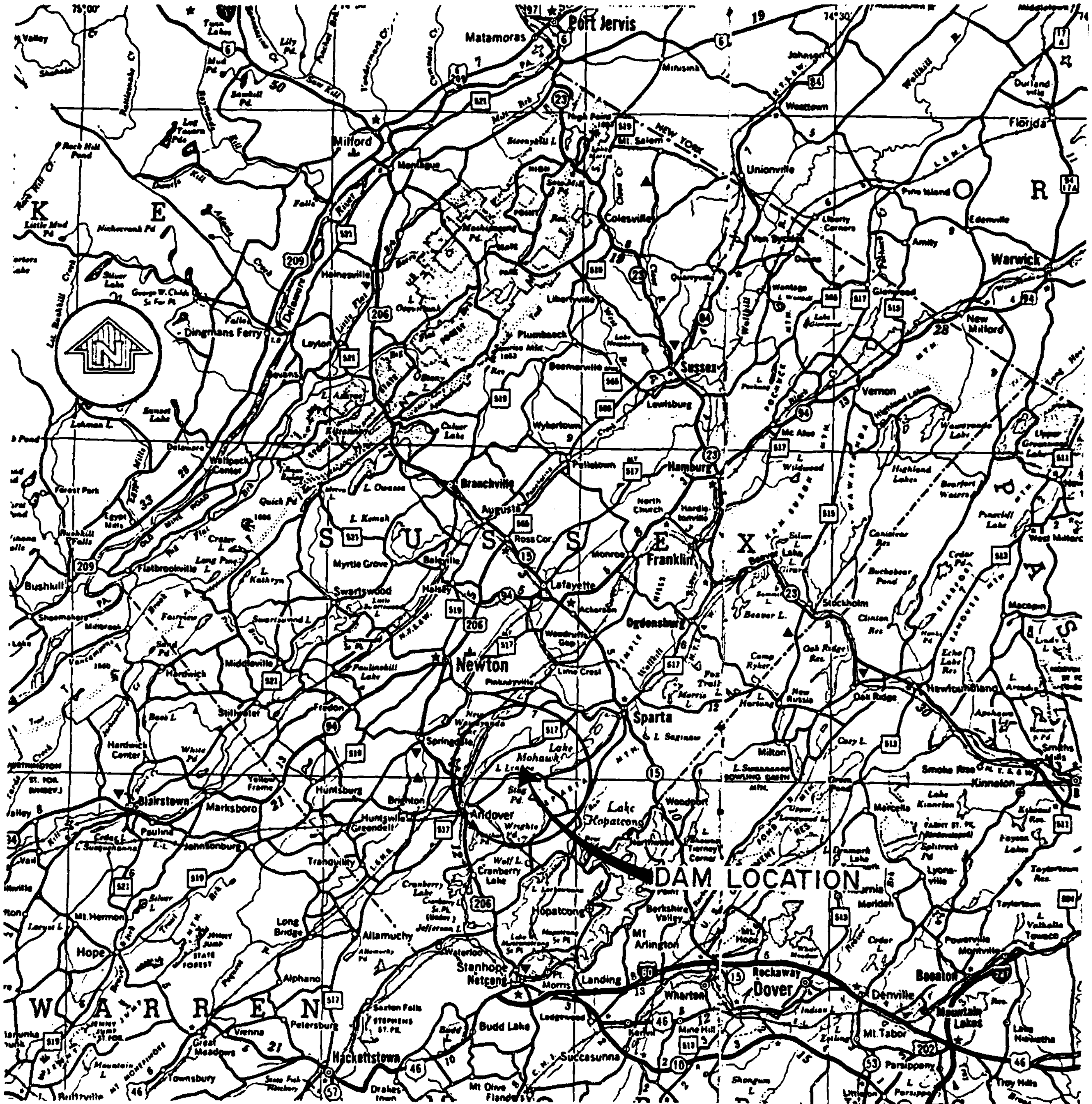
LAKE VALENTINE DAM

BRANCH OF PEQUEST RIVER NEW JERSEY

SCALE: NOT TO SCALE

DATE: JANUARY, 1980

FIGURE 1



SCALE IN MILES

0 5 10

MAP BASED ON STATE OF NEW JERSEY OFFICIAL HIGHWAY MAP AND GUIDE.

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LAKE VALENTINE DAM LOCATION MAP

BRANCH OF PEQUEST RIVER — NEW JERSEY

SCALE SEE BAR SCALE

DATE JANUARY 1980

FIGURE 2

APPENDIX 1

CHECKLIST

VISUAL INSPECTION

LAKE VALENTINE DAM

Check List
Visual Inspection
Phase 1

Name Dam Lake Valentine County Sussex State N.J. Coordinators NJDEP

Date(s) Inspection Nov. 9, 1979 Weather mild, cloudy Temperature 60 degrees

Pool Elevation at Time of Inspection 779. feet NGVD Tailwater at Time of Inspection 770. feet NGVD

Inspection Personnel:

Warren Guinan — Ronald Hirschfeld

Stephen Gilman —

Janusz Czyzowski —

Stephen Gilman/R. Hirschfeld Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion at waterline on upstream slope. Eroded areas are grass covered. Fill has been placed loosely and irregularly on much of downstream slope burying logs, boulders, standing trees and trash.	Downstream and upstream slopes need to be rehabilitated or reconstructed.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good	
RIPRAP FAILURES	No riprap	Provide upstream slope protection.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	No railings	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Hole and eddy in spillway entrance channel. Water discharges from broken section of training well on right bank of spillway channel.	Engage engineer to remedy hole problem.
ANY NOTICEABLE SEEPAGE	Area at downstream toe is wet and soft in deepest part of valley, and seepage is discharging at two locations in this area.	Engage engineer to remedy seepages.
STAFF GAGE AND RECORDER	None observed	
DRAINS	None observed	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Good condition. Minor surface erosion of concrete. Concrete block piers-good condition-some minor erosion of concrete stone masonry abutment wall broken in several places and mortar eroded.	Repair stone masonry wall mortar where eroded and broken
APPROACH CHANNEL	Unobstructed, hole and eddy in channel. See "Junction of Embankment..." on sheet 2 of "Embankment"	
DISCHARGE CHANNEL	Considerable clogging by brush and debris. Trees overhanging channel. Major erosion of left bank of channel downstream of left training well.	Maintain channel clear of debris, cut trees and brush on both sides of channel for a distance downstream of dam
BRIDGE AND PIERS	Fair condition. Wooden bridge in good condition with only minor weathering.	
GATES AND OPERATION EQUIPMENT	Wood stoplog - not visible under water surface.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER	None observed	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gently sloping and wooded, no signs of instability observed	
SEDIMENTATION	No evidence of significant sedimentation observed	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The channel downstream of the dam is rocky overgrown with trees for first 600 feet, well defined.	
SLOPES	The channel slope is steep for approximately 600 feet downstream of the dam and then flattens out.	
APPROXIMATE NO. OF HOMES AND POPULATION	One house approximately 900 feet downstream of the dam (population estimated at 4)	First floor elevation is approximately 11 feet above the streambed, however, garage and basement elevation is only 3 feet above streambed.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	No original plans were disclosed. Plans for this report were developed from visual inspection.
REGIONAL VICINITY MAP	Prepared for this report
CONSTRUCTION HISTORY	No recorded description. Original construction date unknown. Reconstructed in 1935 after failure.
TYPICAL SECTIONS OF DAM	Prepared for this report from visual inspection
HYDROLOGIC/HYDRAULIC DATA	None available
OUTLETS - PLAN	None found
- DETAILS	None found
- CONSTRAINTS	None found
- DISCHARGE RATINGS	None found
RAINFALL/RESERVOIR RECORDS	None found

ITEM	REMARKS
DESIGN REPORTS	None revealed
GEOLOGY REPORTS	None revealed
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None revealed
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None revealed
POST-CONSTRUCTION SURVEYS OF DAM	None revealed
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SERVICES	Unknown
MODIFICATIONS	None discovered
HIGH POOL RECORDS	None revealed
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None found
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Reference data, dams in New Jersey, No. 22-116 from NJDEP files, dated 8/8/35 indicates that the original dam failed in October 1934. According to a local resident the failure was caused by muskrats building in the embankment
MAINTENANCE OPERATION RECORDS	None found

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	No original plans were disclosed. Cross section for this report was prepared from visual inspection
DETAILS	
OPERATING EQUIPMENT	None
PLANS & DETAILS	None

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: .55 sq. mile, hilly, wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 778.9 feet NGVD (55ac-ft)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): not applicable

ELEVATION MAXIMUM DESIGN POOL: 782.1 (½PMF)

ELEVATION TOP DAM: 780.2 feet NGVD

CREST: concrete spillway structure with stoplog section

a. Elevation 778.9 feet NGVD

b. Type concrete step and wooden stoplog

c. Width concrete step-1 foot, wooden stoplog 2 inches

d. Length total 17.5, wooden stoplog-4 feet

e. Location Spillover southwest end of the dam

f. Number and Type of Gates 1 stoplog

OUTLET WORKS: None

a. Type

b. Location

c. Entrance Inverts

d. Exit Inverts

e. Emergency Draindown Facilities

HYDROMETEORLOGICAL GAGES: None

a. Type

b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 83 cfs

APPENDIX 2

PHOTOGRAPHS

LAKE VALENTINE DAM

NOV 09 1979

Looking southwest across the dam.

NOV 09 1979

Upstream face of the dam.

NOV 09 1979

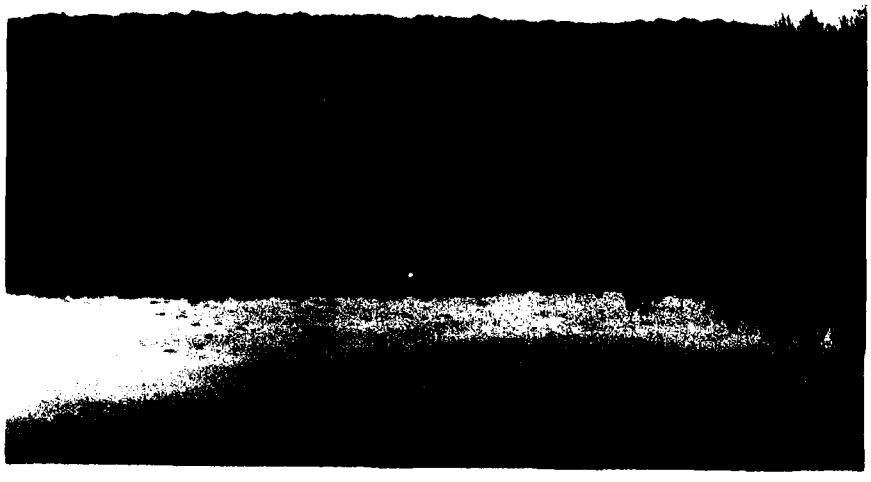
Upstream face of the spillway.

NOV 09 1979

Downstream face of the spillway.

NOV 09 1979

View of the dam looking northwest from the inlet to the reservoir.



NOV 09 1979

Looking at upstream pool from the dam.

NOV 09 1979
Looking at the downstream channel from the spillway.

NOV 09 1979
Looking at downstream face of the dam from northeast abutment.

NOV 09 1979

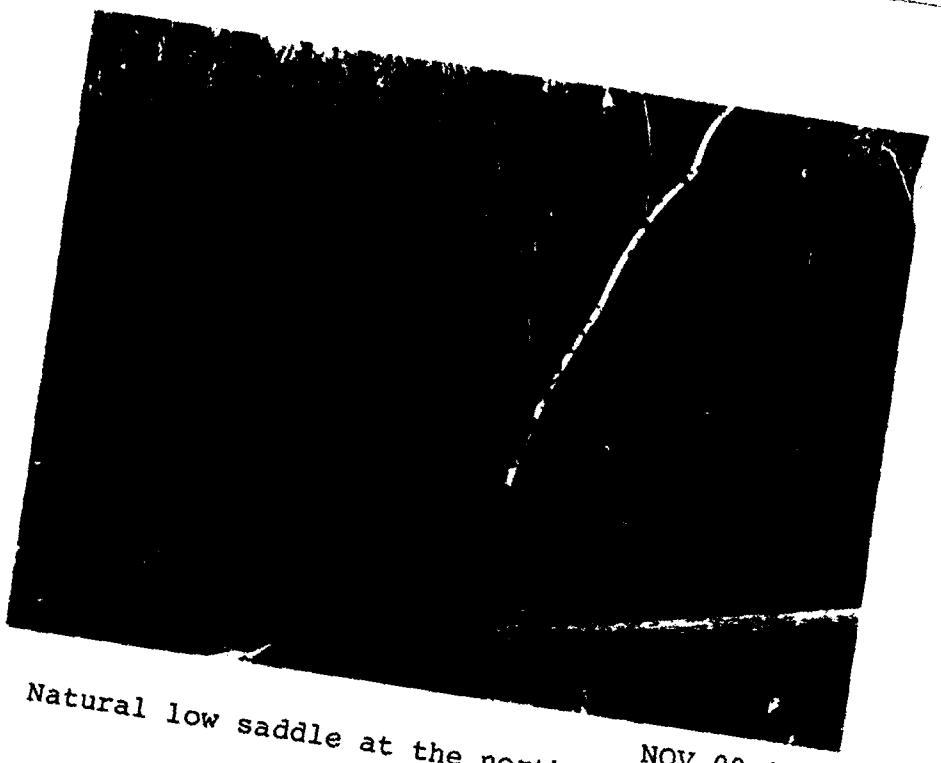
Seepage area at the northeast end of the downstream toe of the dam.

NOV 09 1979

Seepage area at the center of downstream toe of the dam.

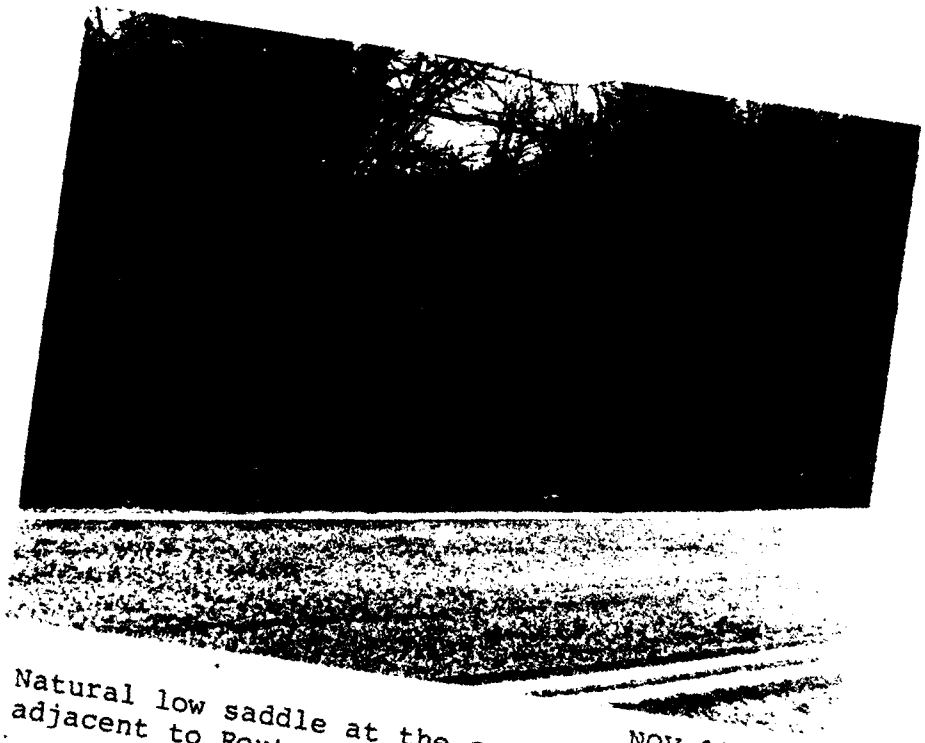
NOV 09 1979
Small sinkhole and whirlpool at right upstream side of spillway entrance channel.

NOV 09 1979
Looking upstream at the channel from the road located about 1100 feet downstream of the dam.



Natural low saddle at the north end of the lake.

NOV 09 1979



Natural low saddle at the south end of the lake adjacent to Route 613.

NOV 09 1979

APPENDIX 3

HYDROLOGIC COMPUTATIONS

LAKE VALENTINE DAM

Anderson-Nichols & Company, Inc.

Subject H & H.

Sheet No. 1 of 12
Date 11-27-79
Computed J. G.
Checked FDD J

JOB NO. 3409 - 12

SQUARES 1/4 IN. SCALE

HYDROLOGIC COMPUTATIONS

LAKE VALENTINE DAM

LOCATION : SUSSEX COUNTY, N. J.

DRAINAGE AREA : .55 SQ. MILE

EVALUATION CRITERIA ; SIZE - SMALL
HAZARD - SIGNIFICANT

Anderson-Nichols & Company, Inc.

Subject H&H

Sheet No. 2 of 12
Date 11-27-79
Computed JDA
Checked JDJ

JOB NO. 3409-12

VALENTINE LAKE DAM - COMPUTATION OF TIME OF CONCENTRATION

CHANNEL FLOW.

LENGTH - $L = 7000$ FT

SLOPE - $S = .0121$

DRAINAGE AREA:

.55 SQUARE MILE

1. $V = \frac{1.49}{n} \cdot R^{2/3} \cdot S^{1/2}$ $n = .07$ $R = 1.9$

$V = 3.6$ FT/S

$T_c = .54$ hr

2. U.S. NAVY - TECHNICAL PUBLICATION NAVDOCKS TP-PW-5 TABLE 82, MARCH 1953

SLOPE 1.2 % ⟶ 2.0 FT/SEC

$\frac{7000}{2 \times 3600} = .97$ hr.

3. METHOD FROM SOIL AND WATER CONSERVATION ENG.

$L = 7000$ FT

$Y = 1.2\%$ (SLOPE)

N = 70 FOR WOODS

$S = \frac{1000}{N} - 10$

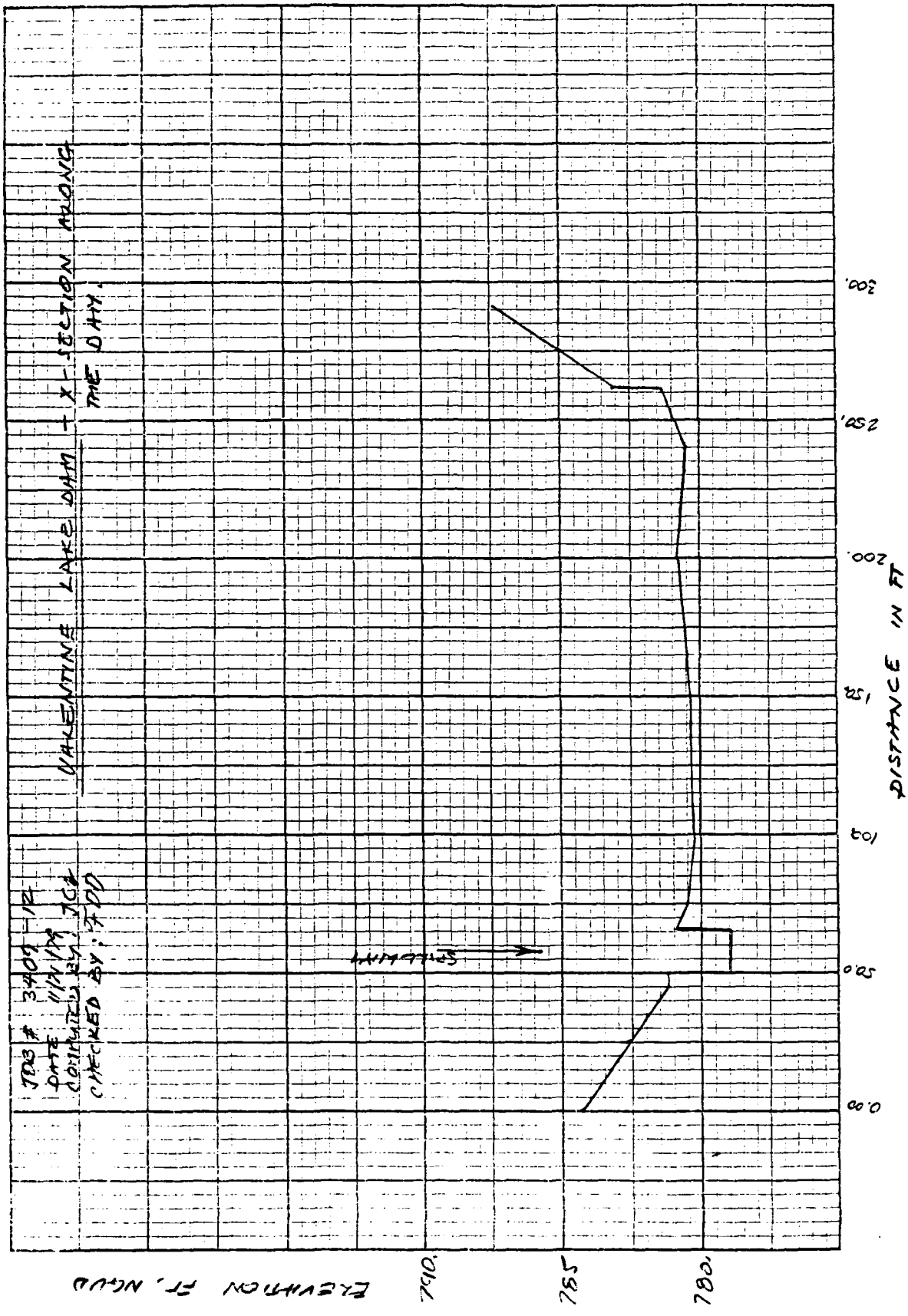
$S = 4.3$

$.6T_c = \frac{L^{.8}(S+1)^{.7}}{1900\, Y^{0.5}}$

$T_c = 2.07$ hr

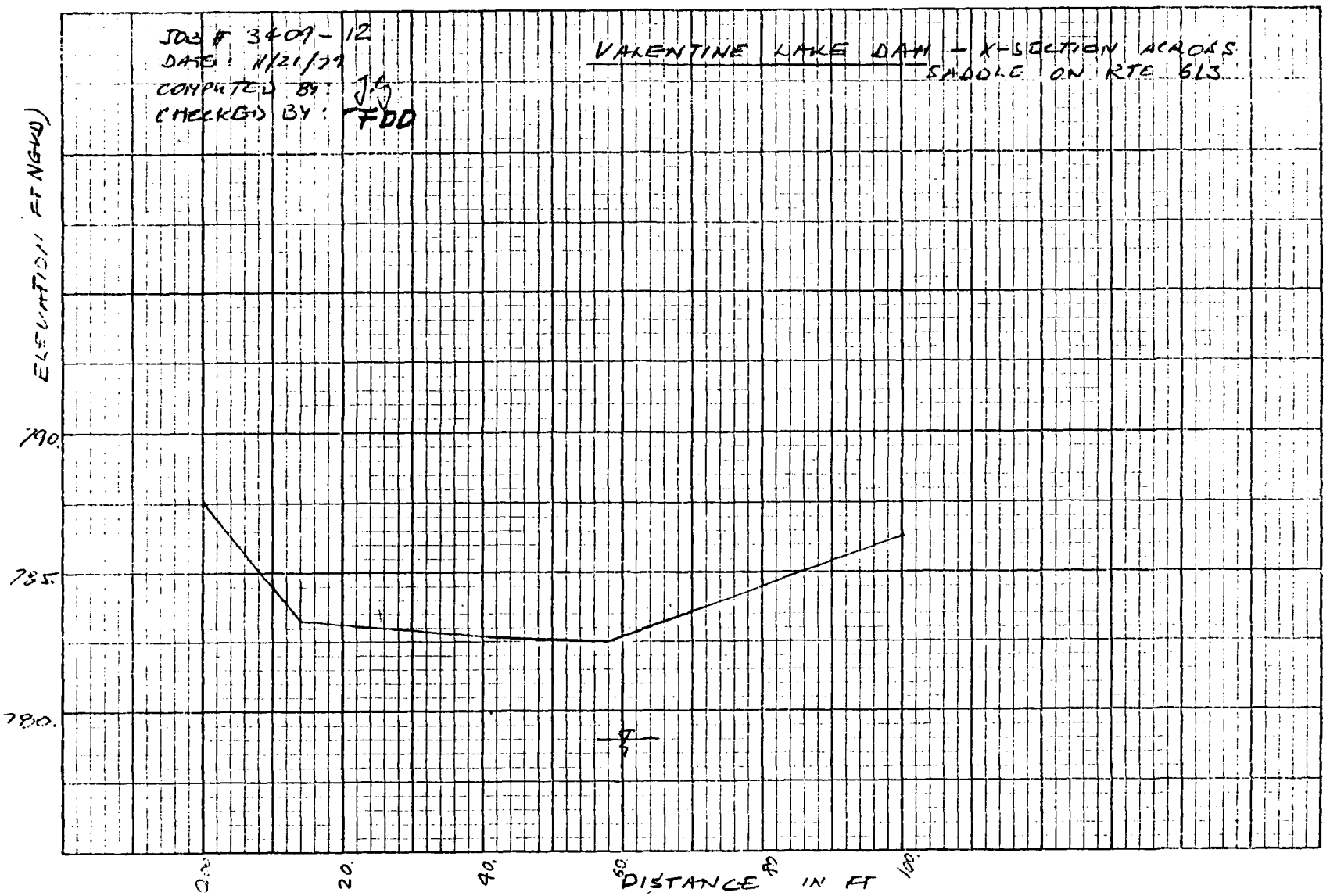
$T_c = 2.07$ IS NOT REASONABLE, SO WILL NOT BE TAKEN TO COUNT IN AVERAGE T_c

AVERAGE $T_c = \frac{.54 + .97}{2} = .76$ hr


JOB # 3404-12
DATE 11/14/79 JCA
COMPUTED BY: JCA
CHECKED BY: TDD
WALENTINE LAKE DAM - X-SECTION ALONG THE DAM
ELEVATION FT. MSL
DISTANCE IN FT
780.
785.
790.
0.00
50.0
100
150
200.
250.
300.
CENTERLINE

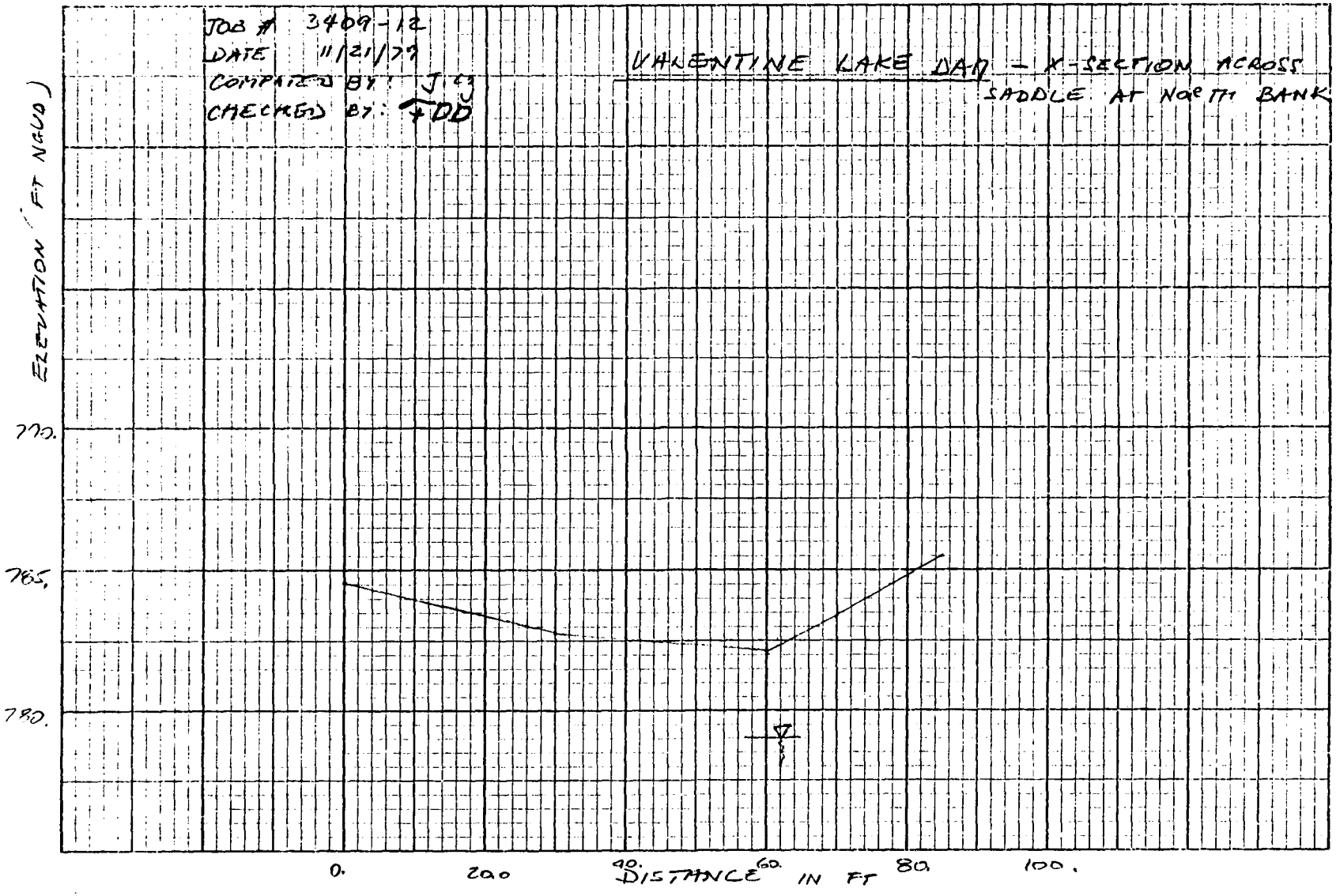
JOB # 3409-12
DATE: 11/21/79
COMPUTED BY: J.G.
CHECKED BY: FDD

VALENTINE LAKE DAM - X-SECTION ACROSS SADDLE ON RTE 613



JOB # 3409-12
DATE 11/21/79
COMPUTED BY: JCJ
CHECKED BY: TDD

VALENTINE LAKE DAM – X-SECTION ACROSS SADDLE AT NORTH BANK



5 of 12

Anderson-Nichols & Company, Inc.

Subject HS, H

Sheet No. 6 of 12
Date 11/21/79
Computed [illegible]
Checked [illegible]

JOB NO. 3409 - 12

SQUARES 1/4 IN SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

VALENTINE LAKE DAM – RATING CURVE COMPUTATION

1. FLOW OVER THE SPILLWAY ONLY :

$C = 3.2$ $\quad Q = C \cdot L \cdot H^{3/2}$

REV. (FT NGVD)	H. (FT)	L. (FT)	Q (CFS)
778.9	0.	0.	
779.	.1	17.5	1.8
779.5	.6	17.5	26.
780.	1.1	17.5	65.
TOP OF DAM 780.2	1.3	17.5	83.
780.5	1.6	17.5	113.
781.	2.1	17.5	170.
781.5	2.6	17.5	235.
782.	3.1	17.5	306.
782.5	3.6	17.5	382.
783.	4.1	17.5	465.
784.	5.1	17.5	645.

2. FLOW OVER THE DAM AND ABUTMENTS (WITHOUT SPILLWAY)

$C = 2.8$ $\quad Q = C \cdot L \cdot H^{3/2}$

REV. (FT NGVD)	H. (FT)	L. (FT)	Q (CFS)
780.2	0.	0.	0
780.5	.3	25.	11.5
781.	.8	110.	220.
781.5	1.3	130.	540.
782.	1.8	150.	1014.
782.5	2.3	160.	1562.
782.	2.9	170.	2230.
784.	3.8	180.	3733.

SQUARES 1/4 IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

3. FLOW OVER THE SADDLE ON RTE 613.

$C = 2.9$ $Q = C \cdot L \cdot H^{3/2}$

ELEV. (FT. NGVD)	H. (FT)	L. (FT)	Q (CFS)
782.5	0.	0.	0.
783.0	.5	45.	46.
784.0	1.5	90.	480.

4. FLOW OVER THE SADDLE AT NORTH BANK.

$C = 2.8$ $Q = C \cdot L \cdot H^{3/2}$

ELEV (FT NGVD)	H (FT)	L (FT)	Q (CFS)
782.1	0.	0.	0
782.5	.4	20.	15.
783.	1.9	60.	140.
784.	2.9	100.	752.

Anderson-Nichols & Company, Inc.

Subject 11 S H

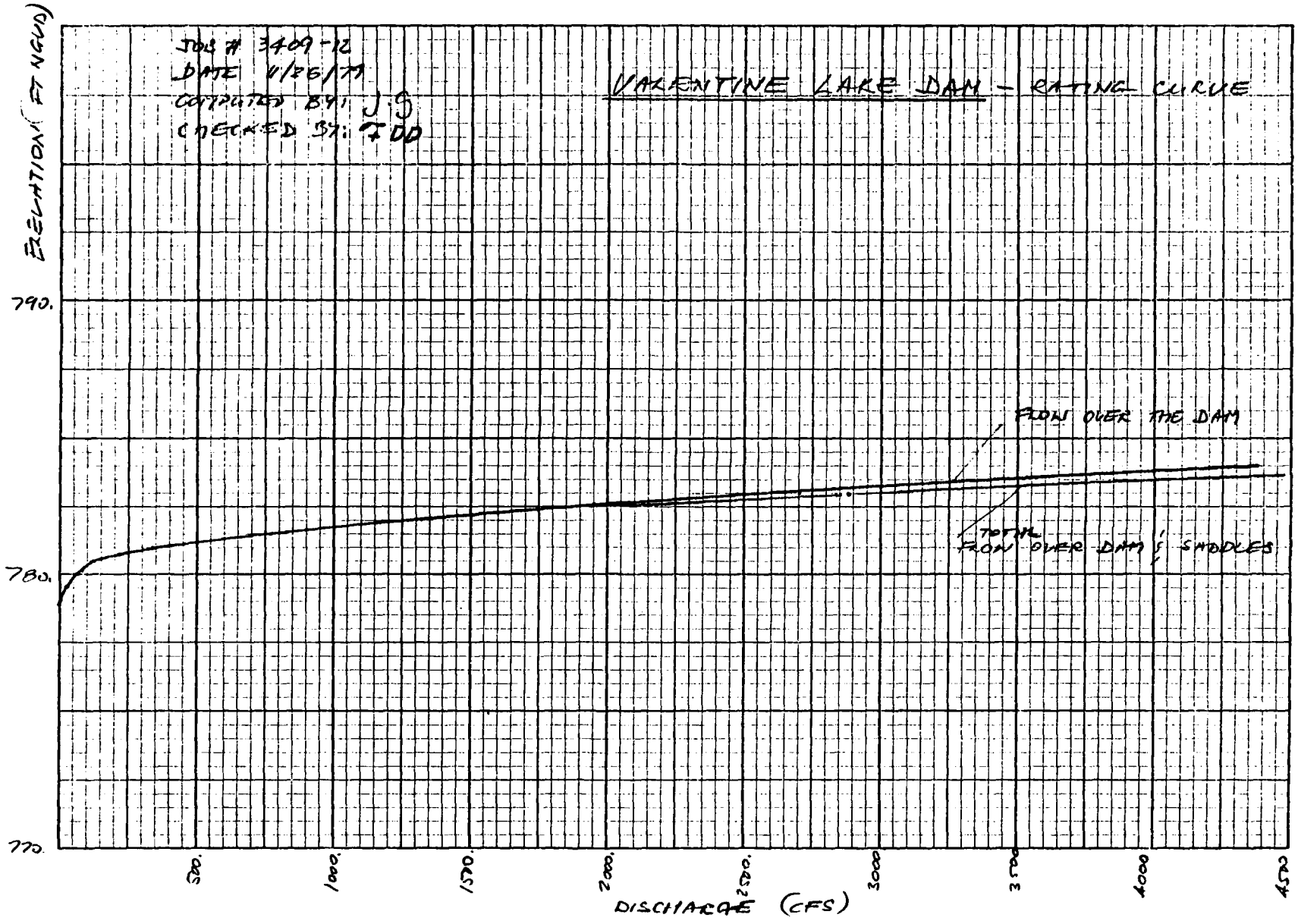
Sheet No. 8 of 12
Date 11/26/79
Computed J.A.
Checked FDD

JOB NO. 3409-12

SQUARES 1/4 I' CALE

VALENTINE LAKE DAM - COMPUTATIONS FOR RATING CURVE.

ELEV. (FT MSL)	Q (CFS) OVER THE SPILLWAY	Q (CFS) OVER THE DAM & HWY	TOTAL Q (CFS) OVER THE DAM	Q (CFS) OVER THE SADDLE ON NORTH BANK	Q (CFS) OVER THE SADDLE ON RTE 613.	TOTAL Q (CFS)
778.9	0.		0.			0.
779.	1.8		1.8			1.8
779.5	26.		26.			26.
780.	65.		65.			65.
TOP OF DAM 780.2	83.	0.	83.			83.
780.5	112.	11.5	125.			125.
781.	170.	220.	390.			390.
781.5	235.	540.	775.			775.
782.	306.	1014.	1320.	0.		1320.
782.5	382.	1563.	1945.	15.	0.	1960.
783.	465.	2230.	2695.	140.	46.	2881.
784.	645.	3732.	4378.	752.	480.	5610.


JOB # 3409-12
DATE 1/26/77
COMPUTED BY: J.S
CHECKED BY: TDD
VALENTINE LAKE DAM - RATING CURVE
ELEVATION (FT NGVD)
790.
780.
770.
FLOW OVER THE DAM
TOTAL FLOW OVER DAM & SADDLES
DISCHARGE (CFS)
3000
4000

SQUARES 1/4 INCH SCALE

LAKE VALENTINE DAM - STORAGE COMUTATION

NORMAL STORAGE (SPILLWAY CREST - 778.9 FTNGVD) - 55 AC-FT

55 AC-FT WAS OBTAINED BY ESTIMATING AVERAGE DEPTH OF RESERVOIR - 5 FT AND PLANIMETERE SURFACE OF RESERVOIR FROM QUAD SHEET - 11.AC.

USING "FRUSTRUM OF PYRAMID EQUTION" AND PLANIMETERED SURFACE AREAS STORAGE-ELEVATION RELATIONSHIP WAS DEVELOP.

$$\Delta V = \frac{1}{3} h \left(b_1 + b_2 + \sqrt{b_1 b_2} \right)$$

h - ELEV. ABOVE NORMAL POOL
b_1 - NORMAL POOL SURFACE
b_2 - ENLARGE POOL - " -

ELEV. (FT NGVD)	b_1 (AC)	b_2 (AC)	h (FT)	ΔV (AC-FT)	TOTAL V (AC-FT)
778.9	11.				55.
780.2	11.	13.5	1.3	15.9	~71.
782.	11.	16.0	3.1	41.6	~97.
784.	11.	19.5	5.1	76.7	~132.

Anderson-Nichols & Company, Inc.

Subject H & H.

Sheet No. 11 of 12
Date 12-26-79
Computed J.G.
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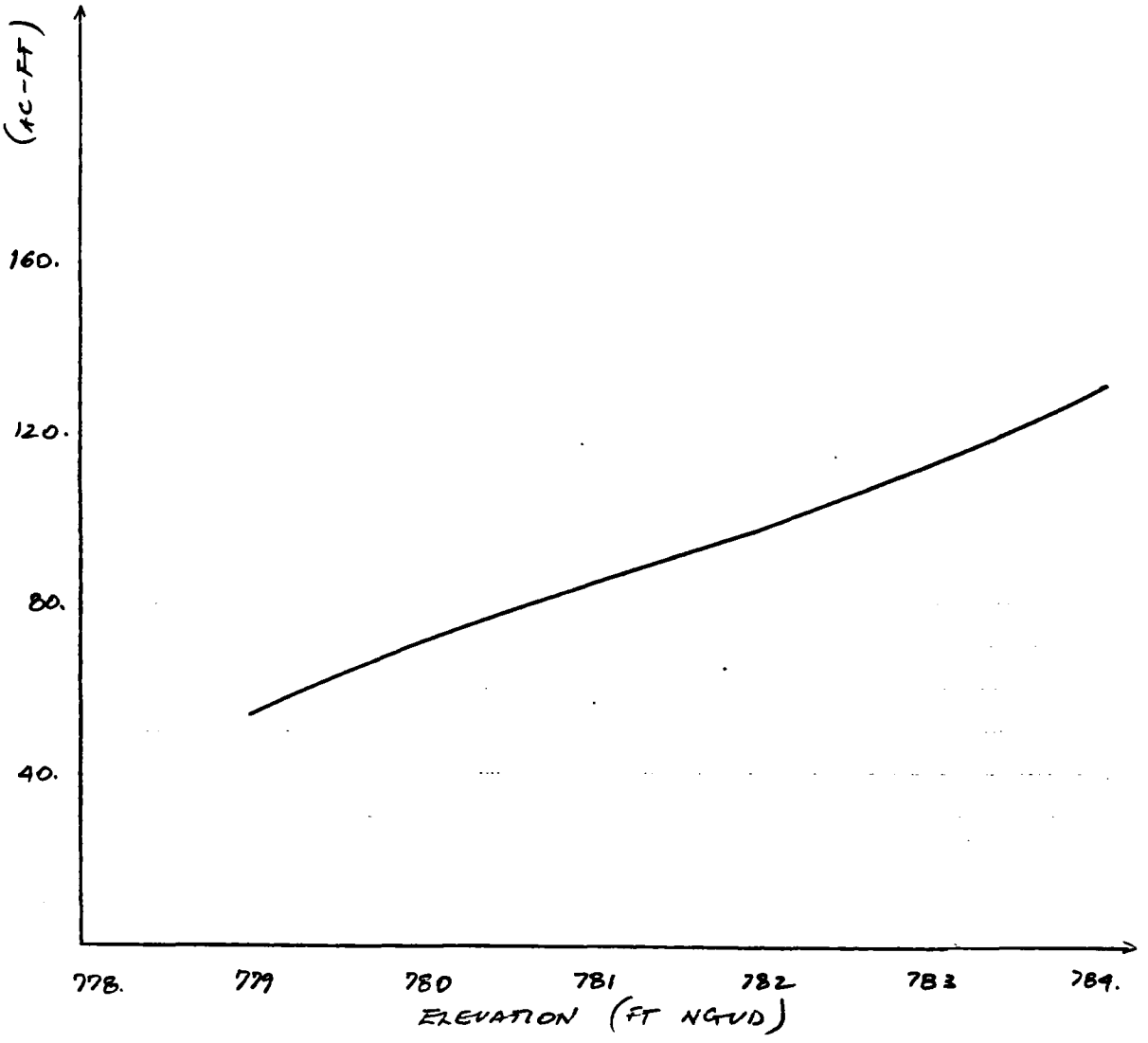
JOB NO. 3409-12 LAKE VALENTINE DAM

SQUARES 1/4 IN SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

STORAGE - ELEVATION CURVE

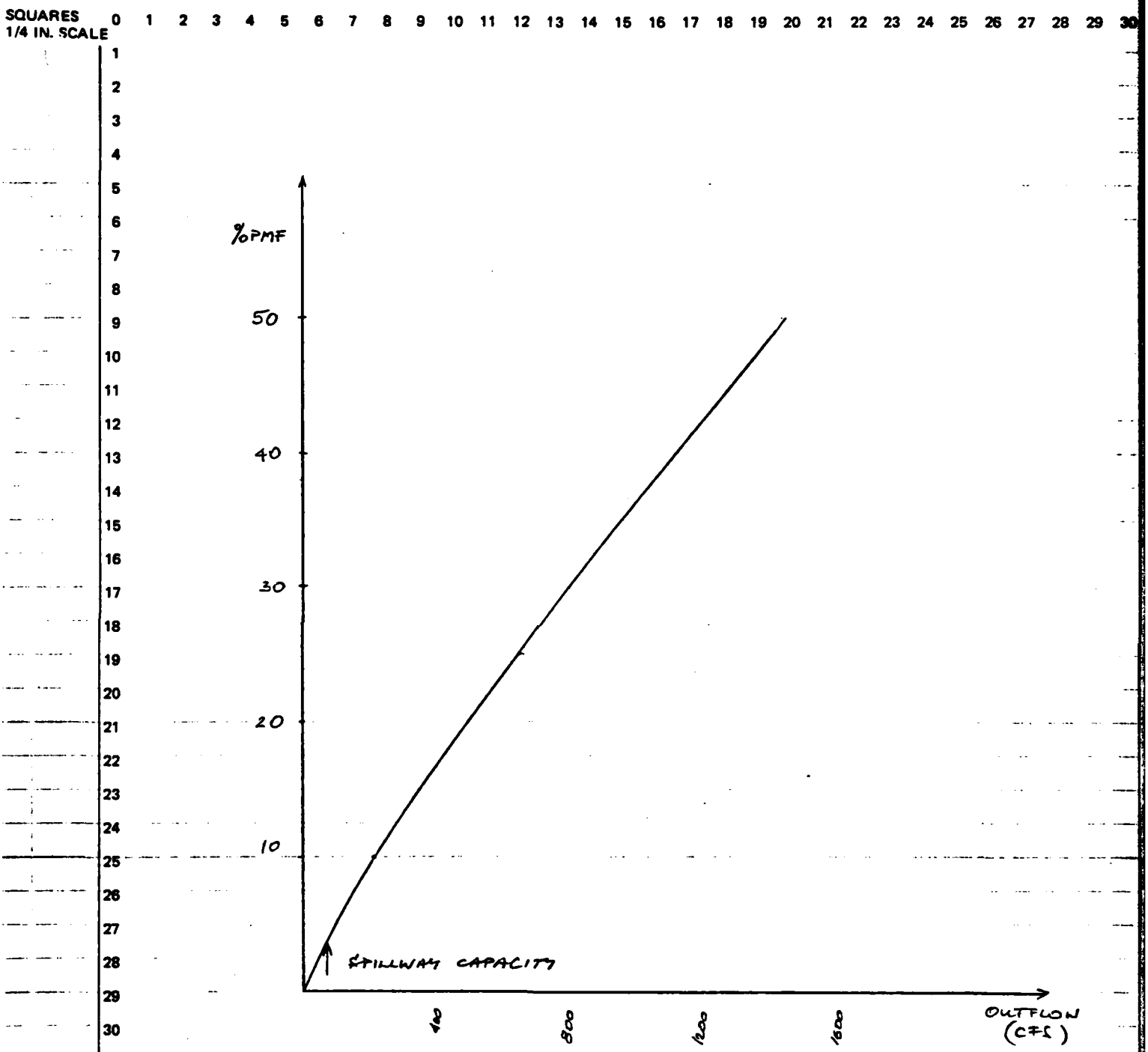


Anderson-Nichols & Company, Inc.

Subject H. & H.

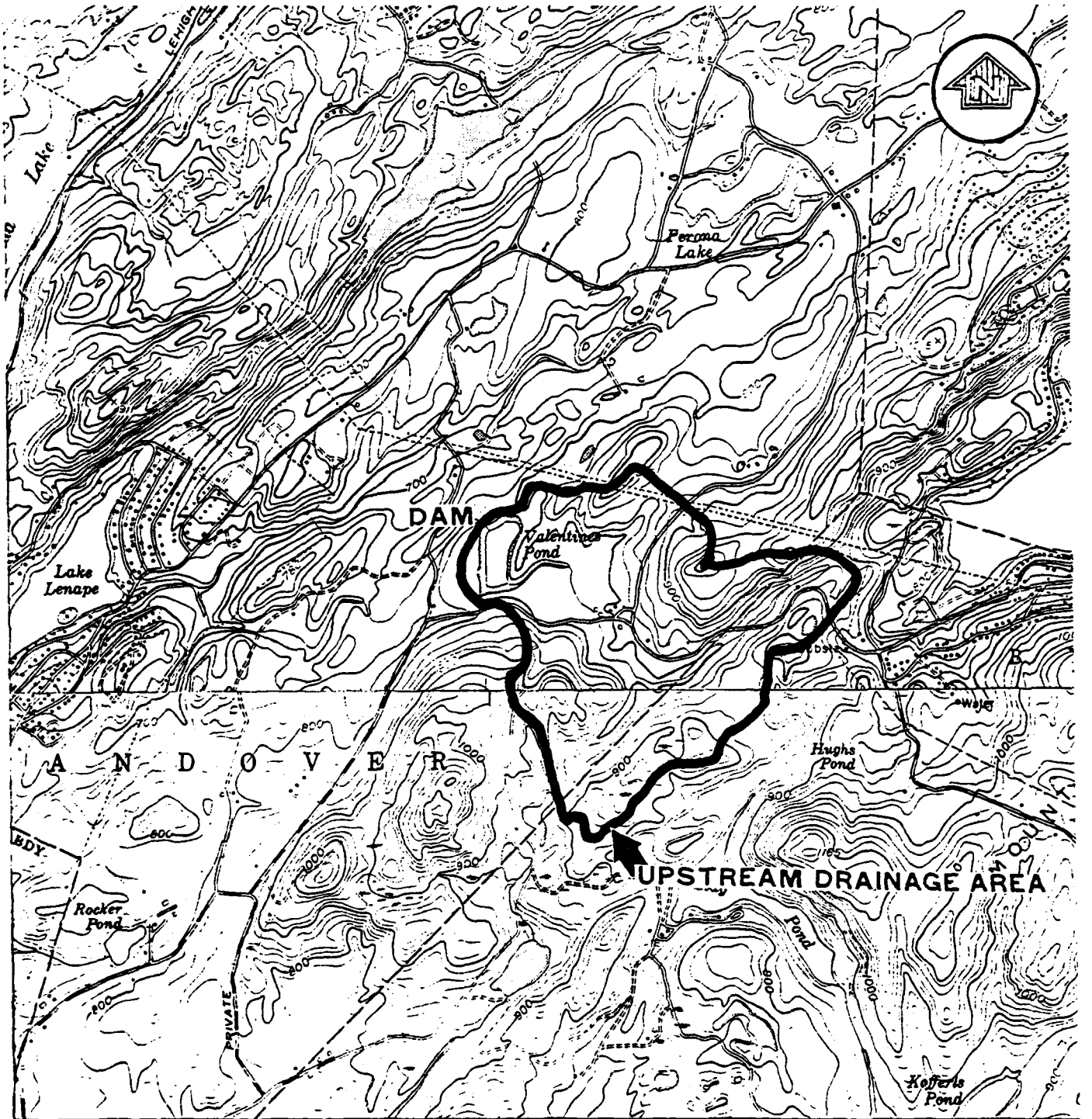
Sheet No. 12 of 12
Date 12-26-79
Computed J.G.
Checked EDD J

JOB NO. 3409 - 12 LAKE VALENTINE DAM



DAM OVERTOPS AT APPROX. ELEVATION 780.2 FT NGVD
WITH Q = 82. CFS

∴ SPILLWAY CAN PASS ~ 3% of PMF.



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LAKE VALENTINE DAM

ANDOVER, NEW JERSEY

REGIONAL VICINITY MAP

JANUARY 1980

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

ANDERSON-NICHOLS & CO., INC. CONCORD, NH

SCALE IN MILES

0 1/2 1

MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE SHEETS. NEWTON EAST, N.J. 1954. REVISED 1971. STANHOPE, N.J., 1954. REVISED 1970.

HEC-1 OUTPUT

LAKE VALENTINE DAM

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                 MAJOR 3809-12 LAKE VALENTINE DAM ANDOVER,N.J. NUB 22-116 USN 297
    2                 *OVERTOPPING ANALYSIS, ANDERSON-NICHOLS & CO. INC. CONCORD,N.H.
    *                 A30.1.0.25,AND 0.5 MULTIPLES OF 24-HOUR PMP.
    4                 P    140        0       10        0        0        0        0        0        0        0
    5                 P1     5
    6                 J      1        3        1
    7                 J1   0.1     0.25      0.5
    8                 *                A1                                 1        1
    9                 *LOCEVELOP INFLOW HYDROGRAPH
   10                 *      1        2      .55                          .8                        1
   11                 I             22.3     113.     124.     132.
   12                 *                                                            1.0      .1
   13                 K2             .46
   14                 Y     -3.
   15                 K      1        A2                                 1        1
   16                 *ROUTE INFLOW HYDROGRAPH THROUGH IMPOUNDMENT
   17                 Y                                       1        1
   18                 Y1     1                                                   -779.      -1
   19                 Y4  778.9     779.     779.5     780.     780.2    780.5     781.     781.5     782.     782.5
   20                 Y4   783.     784.
   21                 Y5     .0      1.0       26.       65.      83.      125.     350.      775.     1320.     1960.
   22                 Y5  2981.     5610.
   23                 Y8    55.       71.       97.      132.
   24                 IC  778.9     780.2     782.      784.
   25                 II  778.9
   26                 ID  780.2
   27                 K      99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	A1
ROUTE HYDROGRAPH TO	A2
END OF NETWORK	

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 79/12/07.
     TIME= 09.36.02.
```

JOB 3409-12 LAKE VALENTINE DAM ANDOVER,N.J. NJM 22-116 USH 297
OVERTOPPING ANALYSIS, ANDERSON-NICHOLS & CO. INC. CONCORD,N.H.
0.1-0.25,AND 0.5 MULTIPLES OF 24-HOUR PMP.

JOB SPECIFICATION

NO	NPR	NPTN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	10	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 3 LRTIO= 1

RTIOS= .10 .25 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

DEVELOP INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A1	0	0	0	0	1	1	0	0

HYDROGRAPH DATA

IHYD	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.55	0.00	.55	.80	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.30	113.00	124.00	132.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
2	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.10	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .40

RECESSION DATA
STRTQ= -3.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 10 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .40 VOL= 1.00

97.	387.	485.	445.	312.	179.	111.	67.	41.	24.
15.	9.	5.	4.	2.	0.				

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.02	0.00	.02	2.	1.01	17.30	91	.40	.39	.02	726.
1.01	.20	2	.02	0.00	.02	2.	1.01	17.40	92	.40	.39	.02	762.
1.01	.30	3	.02	0.00	.02	2.	1.01	17.50	93	.40	.39	.02	798.
1.01	.40	4	.02	0.00	.02	2.	1.01	18.00	94	.40	.39	.02	802.
1.01	.50	5	.02	0.00	.02	2.	1.01	18.10	95	.50	.49	.02	821.
1.01	1.00	6	.02	0.00	.02	2.	1.01	18.20	96	.50	.49	.02	860.
1.01	1.10	7	.02	0.00	.02	2.	1.01	18.30	97	.50	.49	.02	912.
1.01	1.20	8	.02	0.00	.02	2.	1.01	18.40	98	.50	.49	.02	959.
1.01	1.30	9	.02	0.00	.02	2.	1.01	18.50	99	.50	.49	.02	992.
1.01	1.40	10	.02	0.00	.02	2.	1.01	19.00	90	.50	.49	.02	1010.
1.01	1.50	11	.02	0.00	.02	2.	1.01	19.10	91	.46	.44	.02	1017.
1.01	2.00	12	.02	0.00	.02	2.	1.01	19.20	92	.77	.75	.02	1030.
1.01	2.10	13	.02	0.00	.02	2.	1.01	19.30	93	1.38	1.36	.02	1053.
1.01	2.20	14	.02	0.00	.02	2.	1.01	19.40	94	3.45	3.43	.02	1719.
1.01	2.30	15	.02	0.00	.02	2.	1.01	19.50	95	1.00	.98	.02	2592.
1.01	2.40	16	.02	0.00	.02	2.	1.01	20.00	96	.61	.60	.02	3102.
1.01	2.50	17	.02	0.00	.02	2.	1.01	20.10	97	.47	.45	.02	2935.
1.01	3.00	18	.02	0.00	.02	2.	1.01	20.20	98	.47	.45	.02	2398.
1.01	3.10	19	.02	0.00	.02	2.	1.01	20.30	99	.47	.45	.02	1849.
1.01	3.20	20	.02	0.00	.02	2.	1.01	20.40	100	.47	.45	.02	1500.
1.01	3.30	21	.02	0.00	.02	2.	1.01	20.50	101	.47	.45	.02	1294.
1.01	3.40	22	.02	0.00	.02	2.	1.01	21.00	102	.47	.45	.02	1166.
1.01	3.50	23	.02	0.00	.02	2.	1.01	21.10	103	.37	.35	.02	1077.
1.01	4.00	24	.02	0.00	.02	2.	1.01	21.20	104	.37	.35	.02	997.
1.01	4.10	25	.02	0.00	.02	2.	1.01	21.30	105	.37	.35	.02	920.
1.01	4.20	26	.02	0.00	.02	2.	1.01	21.40	106	.37	.35	.02	857.
1.01	4.30	27	.02	0.00	.02	2.	1.01	21.50	107	.37	.35	.02	816.
1.01	4.40	28	.02	0.00	.02	2.	1.01	22.00	108	.37	.35	.02	790.
1.01	4.50	29	.02	0.00	.02	2.	1.01	22.10	109	.02	.01	.02	739.
1.01	5.00	30	.02	0.00	.02	2.	1.01	22.20	110	.02	.01	.02	615.
1.01	5.10	31	.02	0.00	.02	2.	1.01	22.30	111	.02	.01	.02	443.
1.01	5.20	32	.02	0.00	.02	2.	1.01	22.40	112	.02	.01	.02	286.
1.01	5.30	33	.02	0.00	.02	2.	1.01	22.50	113	.02	.01	.02	177.
1.01	5.40	34	.02	0.00	.02	2.	1.01	23.00	114	.02	.01	.02	114.
1.01	5.50	35	.02	0.00	.02	2.	1.01	23.10	115	.02	.01	.02	75.
1.01	6.00	36	.02	0.00	.02	2.	1.01	23.20	116	.02	.01	.02	52.
1.01	6.10	37	.05	0.00	.05	2.	1.01	23.30	117	.02	.01	.02	38.
1.01	6.20	38	.05	0.00	.05	2.	1.01	23.40	118	.02	.01	.02	29.
1.01	6.30	39	.05	0.00	.05	2.	1.01	23.50	119	.02	.01	.02	24.
1.01	6.40	40	.05	0.00	.05	2.	1.01	24.00	120	.02	.01	.02	21.
1.01	6.50	41	.05	0.00	.05	2.	1.01	24.10	121	.02	.01	.02	19.
1.01	7.00	42	.05	0.00	.05	2.	1.01	24.20	122	.02	.01	.02	18.
1.01	7.10	43	.05	0.00	.05	2.	1.01	24.30	123	.02	.01	.02	17.
1.01	7.20	44	.05	.00	.05	2.	1.01	24.40	124	.02	.01	.02	17.
1.01	7.30	45	.05	.04	.02	7.	1.01	24.50	125	.02	.01	.02	17.
1.01	7.40	46	.05	.04	.02	20.	1.01	25.00	126	.02	.01	.02	17.
1.01	7.50	47	.05	.04	.02	38.	1.01	25.10	127	.02	.01	.02	17.
1.01	8.00	48	.05	.04	.02	55.	1.01	25.20	128	.02	.01	.02	17.
1.01	8.10	49	.05	.04	.02	66.	1.01	25.30	129	.02	.01	.02	17.
1.01	8.20	50	.05	.04	.02	72.	1.01	25.40	130	.02	.01	.02	17.
1.01	8.30	51	.05	.04	.02	76.	1.01	25.50	131	.02	.01	.02	17.
1.01	8.40	52	.05	.04	.02	79.	1.01	26.00	132	.02	.01	.02	17.
1.01	8.50	53	.05	.04	.02	80.	1.01	26.10	133	.02	.01	.02	17.
1.01	9.00	54	.05	.04	.02	81.	1.01	26.20	134	.02	.01	.02	17.
1.01	9.10	55	.05	.04	.02	81.	1.01	26.30	135	.02	.01	.02	17.
1.01	9.20	56	.05	.04	.02	82.	1.01	26.40	136	.02	.01	.02	17.
1.01	9.30	57	.05	.04	.02	82.	1.01	26.50	137	.02	.01	.02	17.
1.01	9.40	58	.05	.04	.02	82.	1.01	27.00	138	.02	.01	.02	17.

1.01	9.50	59	.05	.04	.02	82.	1.01	23.10	139	.02	.01	.02	17.
1.01	10.00	60	.05	.04	.02	82.	1.01	23.20	140	.02	.01	.02	17.
1.01	10.10	61	.05	.04	.02	82.	1.01	23.30	141	.02	.01	.02	17.
1.01	10.20	62	.05	.04	.02	82.	1.01	23.40	142	.02	.01	.02	17.
1.01	10.30	63	.05	.04	.02	82.	1.01	23.50	143	.02	.01	.02	17.
1.01	10.40	64	.05	.04	.02	82.	1.02	0.00	144	.02	.01	.02	17.
1.01	10.50	65	.05	.04	.02	82.	1.02	.10	145	0.00	0.00	0.00	16.
1.01	11.00	66	.05	.04	.02	82.	1.02	.20	146	0.00	0.00	0.00	14.
1.01	11.10	67	.05	.04	.02	82.	1.02	.30	147	0.00	0.00	0.00	10.
1.01	11.20	68	.05	.04	.02	82.	1.02	.40	148	0.00	0.00	0.00	7.
1.01	11.30	69	.05	.04	.02	82.	1.02	.50	149	0.00	0.00	0.00	5.
1.01	11.40	70	.05	.04	.02	82.	1.02	1.00	150	0.00	0.00	0.00	4.
1.01	11.50	71	.05	.04	.02	82.	1.02	1.10	151	0.00	0.00	0.00	3.
1.01	12.00	72	.05	.04	.02	82.	1.02	1.20	152	0.00	0.00	0.00	2.
1.01	12.10	73	.34	.32	.02	109.	1.02	1.30	153	0.00	0.00	0.00	2.
1.01	12.20	74	.34	.32	.02	203.	1.02	1.40	154	0.00	0.00	0.00	2.
1.01	12.30	75	.34	.32	.02	340.	1.02	1.50	155	0.00	0.00	0.00	2.
1.01	12.40	76	.34	.32	.02	465.	1.02	2.00	156	0.00	0.00	0.00	2.
1.01	12.50	77	.34	.32	.02	553.	1.02	2.10	157	0.00	0.00	0.00	2.
1.01	13.00	78	.34	.32	.02	603.	1.02	2.20	158	0.00	0.00	0.00	2.
1.01	13.10	79	.40	.39	.02	641.	1.02	2.30	159	0.00	0.00	0.00	2.
1.01	13.20	80	.40	.39	.02	682.	1.02	2.40	160	0.00	0.00	0.00	2.
									SUM	23.55	20.88	2.67	44726.
										(598.)(	530.)(	68.)(	1266.50)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3102.	1127.	310.	279.	44705.
CMS	88.	32.	9.	8.	1266.
INCHES		19.07	20.99	21.00	21.00
MM		484.27	533.19	533.48	533.48
AC-FT		559.	615.	616.	616.
THOUS CU M		689.	759.	760.	760.

HYDROGRAPH AT STA A1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	3.	10.	19.	27.	33.	36.
38.	39.	40.	40.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	41.	41.	41.	41.	41.	41.
41.	41.	55.	102.	170.	232.	276.	302.	320.	341.
363.	381.	394.	401.	411.	430.	456.	480.	496.	505.
508.	520.	502.	859.	1296.	1551.	1468.	1199.	924.	754.
647.	583.	539.	498.	460.	422.	408.	395.	370.	307.
221.	143.	89.	57.	38.	26.	19.	15.	12.	10.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	7.	5.	4.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1551.	564.	155.	140.	22353.
CMS	44.	16.	4.	4.	633.
INCHES		9.53	10.50	10.50	10.50
MM		242.13	266.59	266.74	266.74
AC-FT		279.	308.	308.	308.
THOUS CU M		345.	380.	380.	380.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE INFLOW HYDROGRAPH THROUGH IMPOUNDMENT

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
AS	1	0	0	0	1	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-779.	-1

STAGE	778.00	779.00	779.50	780.00	780.20	780.50	781.00	781.50	782.00	782.50
	783.00	784.00								
FLOW	0.00	1.80	26.00	65.00	83.00	125.00	390.00	775.00	1320.00	1960.00
	2881.00	5610.00								
CAPACITY=	55.	71.	97.	132.						
ELEVATION=	779.	780.	782.	784.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
778.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
780.2	0.0	0.0	0.

```
                          STATION     AC, PLAN 1, RATIO 3

                        END-OF-PERIOD HYDROGRAPH ORDINATES

                                     OUTFLOW
      2.       2.       2.       2.       2.       2.       2.       2.       2.       2.
      2.       2.       2.       2.       2.       2.       2.       2.       1.       1.
      1.       1.       1.       1.       1.       1.       1.       1.       1.       1.
      1.       1.       1.       1.       1.       1.       1.       1.       1.       1.
      1.       1.       1.       1.       1.       1.       2.       2.       4.       6.
      7.       9.      10.      12.      14.      15.      16.      18.      19.      20.
     21.      22.      23.      24.      25.      26.      27.      28.      29.      30.
     31.      32.      33.      37.      45.      58.      76.     101.     132.     212.
    268.     310.     342.     364.     381.     399.     422.     447.     469.     486.
    497.     506.     532.     636.     900.    1258.    1428.    1365.    1159.     940.
    776.     689.     620.     565.     519.     479.     447.     423.     401.     373.
    329.     270.     208.     153.     120.     109.      98.      88.      80.      73.
     67.      62.      58.      53.      50.      46.      43.      40.      38.      35.
     33.      31.      29.      27.      26.      25.      24.      23.      22.      22.
     21.      20.      20.      19.      19.      18.      17.      17.      16.      15.
     14.      14.      13.      12.      12.      11.      11.      10.      10.       9.

                                     STORAGE
     56.      56.      56.      56.      56.      56.      56.      56.      56.      56.
     56.      56.      56.      56.      56.      56.      56.      56.      56.      56.
     56.      56.      56.      56.      56.      56.      56.      56.      56.      56.
     56.      56.      56.      56.      56.      56.      56.      56.      56.      56.
     56.      56.      56.      56.      56.      56.      56.      56.      57.      57.
     58.      58.      58.      59.      59.      60.      60.      60.      61.      61.
     61.      61.      62.      62.      62.      62.      63.      63.      63.      63.
     63.      63.      64.      64.      65.      67.      70.      73.      76.      78.
     79.      80.      81.      82.      82.      83.      83.      84.      84.      84.
     85.      85.      85.      87.      91.      96.      98.      98.      95.      92.
     90.      88.      87.      86.      85.      84.      84.      83.      83.      82.
     81.      79.      78.      76.      75.      74.      73.      72.      71.      70.
     69.      68.      67.      67.      66.      66.      65.      65.      64.      64.
     63.      63.      63.      63.      62.      62.      62.      62.      61.      61.
     61.      61.      61.      61.      60.      60.      60.      60.      60.      60.
     59.      59.      59.      59.      59.      59.      59.      58.      58.      58.

                                      STAGE
   779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0
   779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0
   779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0
   779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0
   779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.0    779.1
   779.1    779.1    779.2    779.2    779.2    779.3    779.3    779.3    779.4    779.4
   779.4    779.4    779.4    779.5    779.5    779.5    779.5    779.5    779.5    779.6
   779.6    779.6    779.6    779.6    779.7    779.9    780.1    780.3    780.5    780.7
   780.8    780.8    780.9    781.0    781.0    781.0    781.0    781.1    781.1    781.1
   781.1    781.2    781.2    781.3    781.6    781.9    782.1    782.0    781.9    781.7
   781.5    781.4    781.3    781.2    781.2    781.1    781.1    781.0    781.0    781.0
   780.9    780.8    780.7    780.6    780.5    780.4    780.3    780.2    780.2    780.1
   780.0    780.0    779.9    779.9    779.8    779.8    779.7    779.7    779.6    779.6
   779.6    779.6    779.5    779.5    779.5    779.5    779.5    779.4    779.4    779.4
   779.4    779.4    779.4    779.4    779.3    779.3    779.3    779.3    779.3    779.3
   779.2    779.2    779.2    779.2    779.2    779.2    779.2    779.2    779.2    779.2

PEAK OUTFLOW IS      1428. AT TIME  16.17 HOURS
```

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1428.	547.	154.	139.	22216.
CMS	40.	15.	4.	4.	629.
INCHES		9.26	10.43	10.44	10.44
MM		235.09	264.81	265.11	265.11
AC-FT		271.	306.	306.	306.
THOUS CU M		335.	377.	377.	377.

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .10	RATIO 2 .25	RATIO 3 .50
HYDROGRAPH AT	A1	.55	1	319.	776.	1551.
		(1.42)		(9.03)(	21.96)(	43.92)(
ROUTED TO	A2	.55	1	210.	660.	1428.
		(1.42)		(5.94)(	18.91)(	40.43)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 **********

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	779.00	778.50	780.20
STORAGE	56.	55.	71.
OUTFLOW	2.	0.	83.

RATIO OF PMS	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	780.66	.46	75.	210.	3.00	16.50	0.00
.25	781.36	1.16	88.	660.	5.67	16.17	0.00
.50	782.08	1.88	99.	1428.	6.83	14.17	0.00

APPENDIX 4

REFERENCES

LAKE VALENTINE DAM

APPENDIX 4

REFERENCES

LAKE VALENTINE DAM

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